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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/594,045

06/27/2007

Koji Nakayama

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EXAMINER

NGUYEN, CUONG QUANG

ART UNIT

PAPER NUMBER

2811

MAIL DATE

DELIVERY MODE

11/26/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/594,045	Applicant(s) NAKAYAMA ET AL.	
	Examiner CUONG Q. NGUYEN	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 1-3 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 4-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11-15-07</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restriction

1. Applicant's election with traverse of Group II, claims 4-9 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 2003/0080384) in view of Tsutsui (US 2004/0027059), Yamamoto et al. (US 2004/0029390), and Goodman et al. (US 4,684,412).

Regarding claim 4, Takahashi et al. discloses a process for manufacturing a bipolar type semiconductor device [0305], a silicon carbide epitaxial layer (182) that has been grown from the surface of a silicon carbide substrate (184), wherein the surface of the silicon carbide substrate is treated by hydrogen etching [0090] and the epitaxial layer is then formed by the epitaxial growth of silicon carbide from the treated surface. See Fig.13A-13C.

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Takahashi et al. does not explicitly teach that a part of a region where an electron and a hole are recombined during current flowing is formed with the silicon carbide epitaxial layer and wherein a surface roughness of the surface of the SiC substrate is in the range of 0.1 to 0.6 nm.

It is conventional and also taught by Tsutsui [0019], Yamamoto et al. [0035], and Goodman et al. (col.1 lines 12-22) that the bipolar transistor is commonly having a region where an electron and a hole are recombined during current flowing.

So. It would have been obvious to one of ordinary skill in the art to form the bipolar transistor including a region where an electron and a hole are recombined during current flowing.

It would also have been obvious to one of ordinary skill in the art to form the SiC substrate having the roughness surface in a range as claimed because Takahashi having the same method to flattened the surface of the surface of the SiC substrate by treated the surface of the substrate with hydrogen. Moreover, the roughness surface of the substrate would have been determinable by one of ordinary skill in the art through no more than routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding claims 6 and 7, Takahashi et al. teaches the epitaxial growth carried out from the (000-1) C plane of the silicon carbide substrate with an off-angle in the range of 0 to 15°. See [0039].

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Claims 5, 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. in view of Tsutsui, Yamamoto et al., and Goodman et al. and further in view of Lee et al. (Surface Preparation of 6H-Silicon Carbide Substrate for Growth of High-Quality SiC Epilayers. Department of EE, the University of Texas at Dallas).

Takahashi et al. does not explicitly teach that prior treated the surface of the SiC substrate with hydrogen etching, the substrate is polished by CMP.

Lee et al. teaches that the SiC substrate is polished by CMP before treated the surface of SiC substrate with hydrogen etching.

It would have been obvious to one of ordinary skill in the art to polish the substrate by CMP prior treated the surface of the substrate with hydrogen etching in order to obtain the smooth surface of the substrate.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cuong Nguyen whose telephone number is (571) 272-1661. The examiner can normally be reached on 8:00 am to 5:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on (571) 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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4. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Cuong Q Nguyen/

Primary Examiner, Art Unit 2811

11/27/2008